QB
721
G3

GALLE'S

CATALOGUE OF COMETS

FROM 1860 TO 1884

WINLOCK

QaA. 4.10

Library of
NON MINISTRARI SED MINISTRARE.
Wellesley College.
Presented by
Prof. E. N. Horsford.
No 34677

GALLE'S

CATALOGUE OF COMETS,

From 1860 to 1884.

Translated from the "Astronomische Nachrichten," Nos. 2665 and 2666.

—BY

WILLIAM C. WINLOCK,

And reprinted from

THE SIDEREAL MESSENGER,

For November, 1885, and January and February, 1886.

2/6 net

34677
Astronomy Library
QB
721
G3

GALLE'S

CATALOGUE OF COMETS,

FROM 1860 TO 1884.

tr. [illegible]

[The following catalogue of more recent comets is from Dr. J. G. Galle's "Uebersicht ueber die Bahn-Elemente der seit dem Jahre 1860 erschienenen Cometen, sowie ueber neu berechnete oder verbesserte Bahnen von Cometen der frueheren Zeit," contained in Nos. 2665 and 2666 of the *Astronische Nachrichten* (vol 112, 1–26) omitting his list of newly-computed orbits of comets earlier than 1860. The significance of the symbols, *T*, π, ☊, etc., has been inserted for convenience, and in the references to journals the volume (in Arabic numerals) and page, separated by a colon are generally given. W. C. W.]

The list of comets given in the third edition of "Olbers Methode zur Berechnung der Cometenbahnen" ends with the year 1863, and for several years I have desired to bring together the additions which have accumulated since that time, together with the list of 1847 and the supplement of 1864,—into one newly-arranged catalogue: I have not thus far, however, been able to carry out my scheme as planned. In the meantime, on account of the great number of new comets, there has appeared to be a real need of such a list, and a wish expressed by the editor of this journal *[Astron. Nachr.]* has induced me to compile, as a temporary substitute, a brief synopsis of the newly added comet orbits, following in its tabular form the list of 1864. Our limited space allows for each comet merely the approximate data from a single (if possible, the latest) orbit, and the remarks are restricted to the reference for this orbit, the date of discovery, the duration of visibility, and a few other notes, principally brief remarks on the orbit given.

The headings, T, π, ☊, i, log. q, e, in the table are those commonly used, and correspond with the list of 1864, except that the column "mean motion," as it is called, has been omitted.

T=Paris mean time of perihelion passage.
π=Longitude of the perihelion.
☊=Longitude of the ascending node.
i=Inclination of the plane of the orbit to that of the ecliptic.
log. q=Log. perihelion distance.
e=eccentricity.

The distinction between direct and retrograde motion *(D* and *R)* is, also, for the present retained. In retrograde orbits we readily change from one system of reckoning, π, i, to the other, π', i', by means of the relations

$$\pi+\pi'=2\,☊$$
$$i+i'=180^\circ$$

and it is only necessary to remember that the distance, ω, of the perihelion from the node in the retrograde reckoning is not $\pi=☊+\omega$, but $\pi=☊-\omega$.

The comets are arranged strictly in the order of their perihelion passage. This is a long established and very natural system and one possessing numerous advantages: furthermore, it has lately been made the rule of the *Astronomische Gesellschaft*, so that it will require no further discussion here. The uncertainty sometimes existing in the designation of particular comets during the year of discovery can always be easily removed, for the time being, by the addition of the name of the discoverer. Moreover a strict adherence to this system of numbering comets in each year has become necessary of late, partly on account of the greater number of comets discovered, and partly on account of the considerable increase of the known periodic comets, during the last forty years; for the actually observed returns of these comets must be arranged with the other comets. Since in many cases the periodicity has first been established at the second apparition, and in a few cases at the third, the exclusion of periodic comets from the list of apparitions of each year would frequently cause annoying changes in the designations of earlier years, and it would give rise to all sorts of ambiguity. In the publications of the past ten years, the periodic comets, particularly, have led to a great many differences in the designation of comets, an evil which is not merely of a theoretical nature, but, for those who often have occasion to refer to the literature of comets, is one which carries with it very real and practical inconveniences, frequently necessitating much troublesome comparison of observations, or of ephemerides. to decide what comet really is referred to. Especially in years in which a great many comets are seen, if the names of the discoverers are not given, there is not only loss of time, but besides this mistakes easily occur.

In the list published in 1864 this arrangement of the observed apparitions of comets in the order of perihelion passage is closely followed out to the end of the year 1863. The present supplement, however, on account of further discussion of data belonging to the years immediately preceding, I have begun with the year 1860, so that it contains the orbits of all computed comets (ninety-four in number) for the twenty-five years from 1860 to 1884.

The numbering in the first column of the table follows that of the table published in 1864. Although these numbers have no special signification here; and, as numerous insertions have been made, they ought really to be increased, still, on account of their connection with the earlier list, they have been retained. Interpolations between the earlier numbers are marked with the letters *a*, *b*, *c*, etc. The current numbers of the present list are therefore to be increased by 6+6+4=16, so that at the end of the year 1884 the number of different comets of which orbits have been computed, is 302. The number of apparitions of comets, including the present recorded returns of periodic comets, is considerably greater.

d'Arrest's Comet has been observed 4 times.
Biela's " " " " 6 "
Brorsen's " " " " 5 "
Encke's " " " " 23 "
Faye's " " " " 6 "

HALLEY'S	Comet	has	been	observed	7	times.
PONS'	"	"	"	"	2	"
TEMPEL'S$_1$	"	"	"	"	3	"
TEMPEL'S$_2$	"	"	"	"	2	"
TEMPEL'S$_3$	"	"	"	"	2	"
TUTTLE'S	"	"	"	"	3	"
WINNECKE'S	"	"	"	"	4	"

Accordingly 67−12=55 repeated apparitions are to be added, bringing up to 357 the total of the observed appearances of comets. In this summary, of course, no allowance is made for the great uncertainty of many of the older orbits, or for the fact that in some cases it is doubtful whether the *same* periodic comet has been seen.

In the table for the period since 1860, it appeared desirable to show at a glance the returns of the periodic comets in their chronological order, and to be able to find them among the comets arranged for each year strictly according to perihelion passage, without further reference. There are accordingly added to the numbers in the first column (which always refer to the first appearance of the comet) the initial letter of the name commonly in use for the comet:

D'A=D'ARREST'S comet, B=BIELA, Br=BRORSEN, E=ENCKE, F=FAYE, H=HALLEY, P=PONS 1812, T$_1$, T$_2$, T$_3$=TEMPEL'S three comets, 1867 II, 1873 II, 1869 III, Tu=TUTTLE, W=WINNECKE. As no fixed rule for designating periodic comets has been established—and indeed none can be established without great difficulty—I have retained the designation which seemed to me to be most generally used. If other names should be preferred, the designation can easily be changed, without disturbing the numbering of the comets according to perihelion passage—the only point considered essential. TEMPEL'S three comets I have distinguished according to their periods as finally fixed by the observed returns; T$_2$ being the last discovered of these three comets. It is readily seen that some rule of this sort must be used in such cases, in order that subsequent changes may be avoided.

There are since 1864 quite a number of comets which have been incompletely observed. or, at all events, for which only uncertain data are at hand, so that no orbit could be deduced. In some instances, the observations are so imperfect that no great value can be attached to the computed orbit. All such comets are found (as in the catalogue of 1864) with necessary references, among the notes for the different years.

Finally, it is to be mentioned that for the equinox to which the elements are referred, the mean equinox of the beginning of the year in question is, generally, to be understood. This plan for facilitating the comparison of comet orbits was proposed by Olbers, and it will be recognized by astronomers as the commonly accepted rule. In the elements of some of the periodic comets where perturbations have been taken into account, the equinox of the beginning of the decade has lately been used to some extent, and in these cases, in the present table (which gives only minutes; and for all more accurate computations, reference must be made to the sources which are quoted) I have reduced the longitudes to the beginning of the year of the observed return.

The following abbreviations are used for journals frequently referred to:

A. N.=*Astronomische Nachrichten.*
M. N.=*Monthly Notices of the Royal Astronomical Society.*
C. R.=*Comptes Rendus hebdomadaires de l'academie des sciences de Paris.*
A. V. S.=*Vierteljahrs-Schrift der Astronomtsche Gesellschaft.*
Wien. Ak. S. B.=*Sitzungsberichte der k. Akad. d. Wiss. in Wien, math. phys. Classe.*

[The reference is usually to the volume and page (or column in A. N.) which are separated by a colon. Further abbreviations will explain themselves.]

216 A. N. 72: 236. Discovered by Liais at Olinda, Brasil, February 26, and observed by him till March 13, on seven days. Not observed except by the discoverer. The second certainly known example of a double comet. Pechule has computed the orbits of the two nuclei separately.

217. Bull. de St. Petersb. 6: 363. From all the observations

formed into six normal places, which are well represented. Discovered by G. RUMKER at Hamburg, April 17. The observations of this faint comet extend over a little more than a month, a single observation of BOND's on June 11, excepted.

218. Schriften der Berl. Akad. 1867. Bright comet visible to the naked eye at various places in Europe from June 18, to about the middle of July; observed at Santiago to September 12, and at the Cape to October 18. The most probable orbit, deduced by AUWERS from a very careful discussion of the observations, showed no deviation from a parabola; similar result by FISCHER, A. N. 67: 291.

219. A. N. 75: 165. Discovered October 23 by TEMPEL at Marseilles and observed there on the day following, and, also, October 25, at Paris. The above orbit rests on a new reduction of TEMPEL's observations, and agrees very closely with a provisional computation by v. OPPOLZER (A. N. 73: 189. The orbits by VALZ, widely differing from these are to be rejected, and an identity with an object observed on November 14 seems inadmissible.

220. A. N. 62: 187. First discovered April 4 by THATCHER at New York. Seen in Europe on April 30, with the naked eye by BAEKER at Nauen. Before perihelion, observed in the northern hemisphere (at Washington and Athens) to May 25; after perihelion by MOESTA at Santiago, July 30 to August 15; by MANN at the Cape, August 18 to September 6. The definitive orbit by v. OPPOLZER is deduced from seven normal places (April to September) and gives a period of 415.43 years. The orbit comes very close to the *Earth's* orbit—evidently connected with the periodic meteors of April 20.

221. Diss. inaug. Bonn. 1880, p. 146. This great comet at its ascending node was almost directly between the *Earth* and the *Sun*, and as the plane of its orbit is almost perpendicular to the ecliptic, it appeared very suddenly in the northern hemisphere, June 29–30, in its full splendor. In the southern hemisphere it had already been discovered, May 13, by TEBBUTT at Windsor. It remained visible for a long time in the northern hemisphere—far north in declination—and could be followed (at Pulkowa) even to May 1, 1862. The definitive orbit which

SUMMARY OF THE ORBIT-ELEMENTS OF COMETS WHICH HAVE APPEARED SINCE 1860.

No.	Year	T [Paris M. T.]			π		☊		i		log. q	e	Mot.	Computer.
			h	m	°	′	°	′	°	′				
216 {	1860 I A	Feb. 16,	15	9	173	50	324	4	79	40	0.0788		D	} Pechule
	1860 I B	Feb. 16,	16	14	173	45	324	3	79	36	0.0785		D	
217	1860 II	Mar. 5,	13	44	50	5	8	53	48	13	0.1162		D	Gylden
218	1860 III	June 16,	1	18	161	32	84	41	79	19	9.4667		D	Auwers
219	1860 IV	Sept. 22,	7	38	356	48	44	51	32	12	9.8342		D	Kowalczyk
220	1861 I	June 3,	9	31	243	22	29	56	79	46	9.9641	0.98346	D	v. Oppolzer
221	1861 II	June 11,	12	19	249	5	278	59	85	26	9.9151	0.98508	D	Kreutz
222	1861 III	Dec. 7,	4	21	173	31	145	6	41	59	9.9238		R	Noether
(96) E	1862 I	Feb. 6,	5	59	158	1	334	31	13	5	9.5314	0.84670	D	v. Asten
223	1862 II	June 22,	0	53	299	20	326	33	7	54	9.9918		R	Seeling
224	1862 III	Aug. 22,	22	3	344	42	137	27	66	26	9.9835		R	v. Oppolzer
225	1862 IV	Dec. 28,	4	20	125	11	355	46	42	29	9.9048		R	Krahl
226	1863 I	Feb. 3,	11	55	191	23	116	56	85	22	9.9002		D	Engelmann
227	1863 II	Apr. 4,	21	52	247	16	251	16	67	22	0.0286		R	Frischauf
228	1863 III	Apr. 20,	20	49	305	47	250	11	85	29	9.7985		D	Frischauf
229	1863 IV	Nov. 9,	11	50	94	43	97	29	78	5	9.8492		D	v. Oppolzer
230	1863 V	Dec. 27,	18	28	60	24	304	43	64	29	9.8873		D	Valentiner
231	1863 VI	Dec. 29,	4	17	183	8	105	2	83	19	0.1183		D	Rosen
232	1864 I	July 27,	19	38	188	53	174	59	45	0	9.7966		R	Kowalczyk
233	1864 II	Aug. 15,	14	0	304	12	95	15	1	52	9.9587	0.99635	R	Kowalczyk
234	1864 III	Oct. 11,	10	37	159	18	31	45	70	18	9.9690		R	v. Asten
235	1864 IV	Dec. 22,	10	59	321	41	203	13	48	53	9.8869		D	Kowalczyk
236	1864 V	Dec. 27,	17	26	162	24	340	54	17	7	0.0471		R	Valentiner
237	1865 I	Jan. 14,	7	58	141	16	253	3	87	32	8.4148		R	Tebbutt
(96) E	1865 II	May 27,	22	21	158	4	334	33	13	4	9.5327	0.84630	D	v. Asten
228	1866 I	Jan. 11,	3	22	60	28	231	26	17	18	9.9897	0.90542	R	v. Oppolzer
(163) F	1866 II	Feb. 13,	23	32	49	56	209	42	11	22	9.2259	0.55754	D	Moeller
239	1867 I	Jan. 19,	20	49	75	52	78	36	18	13	0.1966	0.84906	D	Searle
240 T_1	1867 II	May 23,	22	15	236	9	101	10	6	25	0.1941	0.50971	D	Sandberg
241	1867 III	Nov. 6,	23	15	276	22	64	59	83	26	9.5191		R	v. Oppolzer
(171) Br	1868 I	Apr. 17,	10	17	116	2	101	14	29	22	9.7760	0.80797	D	Schulze
242	1868 II	June 26,	11	35	285	38	52	15	48	27	9.7624		R	Karlinski
(96) E	1868 III	Sep. 14,	11	53	158	11	334	32	13	7	9.5233	0.84913	D	v. Asten
(131) W	1869 I	June 29,	22	44	275	55	113	33	10	48	9.8929	0.75190	D	v. Oppolzer
243	1869 II	Oct. 9,	20	39	123	17	311	30	68	20	0.0902		R	Kowalczyk
244 T_3	1869 III	Nov. 18,	19	25	42	58	296	44	5	24	0.0266	0.65813	D	{ Schulhof and Bossert
245	1870 I	July 14,	2	8	303	32	141	45	58	12	0.0038		R	Seydler
246	1870 II	Sept. 2,	4	53	17	53	12	56	80	39	0.2593		R	Gerst
(189) D'A	1870 III	Sept. 22,	16	46	318	41	146	25	15	39	0.1073	0.63487	D	Leveau
247	1870 IV	Dec. 19,	21	11	4	9	94	45	32	44	9.5902		R	Schulhof
248	1871 I	June 10,	14	33	141	50	279	19	87	36	9.8158	0.99781	D	Holetschek
249	1871 II	July 27,	0	59	115	31	211	54	78	1	0.0348		R	Cramer
(102) Tu	1871 III	Nov. 30,	11	18	116	5	269	18	54	17	0 0129	0.82105	D	Tischler
250	1871 IV	Dec. 20,	9	18	264	13	147	6	81	40	9.8397	0.99613	R	A. Lindhagen
(96) E	1871 V	Dec. 28,	19	33	158	13	334	34	13	7	9.5224	0.84935	D	v. Asten
(240) T_1	1873 I	May 9,	15	21	237	58	78	43	9	46	0.2484	0.46308	D	R. Gautier
251 T_2	1873 II	June 25,	5	9	306	6	120	57	12	45	0.1284	0.55260	D	Schulhof
(163) F	1873 III	July 18,	11	50	50	5	209	41	11	22	0.2260	0.55738	D	Moeller
252	1873 IV	Sept. 10,	18	58	36	48	230	35	84	1	9.8999	0.99647	R	R. Gautier
253	1873 V	Oct. 1,	18	28	302	58	176	43	58	31	9.5853		R	Weiss
(171) Br	1873 VI	Oct. 10,	11	49	116	5	101	15	29	25	9.7736	0.80883	D	Schulze
254	1873 VII	Dec. 3,	2	53	85	30	248	37	26	29	9.8895	0.77062	D	Weiss

No.	Year	T [Paris M. T.]		π		☊		i		log. q	e	Mot.	Computer
		h	m	°	′	°	′	°	′				
255	1874 I	Mar. 9, 22	35	299	48	30	18	58	53	8.6490		D	Wittstein
256	1874 II	Mar. 13, 22	37	302	22	274	7	31	35	9.9473		R	Wenzel
257	1874 III	July 8, 20	45	271	6	118	44	66	21	9.8298	0.99882	D	v. Hepperger
258	1874 IV	July 17, 16	57	5	27	215	51	34	8	0.2274	0.96283	D	Holetschek
259	1874 V	Aug. 26, 20	24	344	8	251	30	41	50	9.9924	0.99883	D	Gruss
260	1874 VI	Oct. 18, 22	47	265	41	281	58	80	47	9.7061		R	Holetschek
[131] W	875 I	Mar. 12, 2	34	276	38	111	29	11	17	9.9185	0.74101	D	v. Oppolzer
[96] E	1875 II	Apr. 12, 23	58	158	17	334	37	13	7	9.5223	0.84942	D	v. Asten
261	1877 I	Jan. 19, 4	27	200	5	187	15	27	5	9.9071		R	Thraen
262	1877 II	Apr. 17, 15	54	253	29	316	37	58	51	9.9777	0.99870	R	Plath
263	1877 III	Apr. 26, 20	0	102	52	346	4	77	10	0.0040		D	Zelbr
[189] D'A	1877 IV	May 10, 8	9	319	7	146	7	15	43	0.1199	0.62780	D	Leveau
264	1877 V	June 27, 1	51	81	2	184	17	64	15	0.0296		R	Gruss
265	1877 VI	Sept. 11, 9	57	107	38	250	59	77	42	0.1977		R	Plummer
266	1878 I	July 20, 16	44	279	50	102	16	78	11	0.1436		D	Buettner
[96] E	1878 II	July 26, 2	56	158	20	334	39	13	7	9.5230	0.84917	D	v. Asten
[251] T_2	1878 III	Sept. 7, 6	25	306	8	121	1	12	46	0.1270	0.55369	D	Schulhof
[171] Br	1879 I	Mar. 30, 2	0	116	14	101	18	29	23	9.7708	0.80980	D	Schulze
267	1879 II	Apr. 27, 10	18	42	1	45	46	72	58	9.9526		R	Kremser
240 T_1	1879 III	May 10, 21	52	238	12	78	46	9	47	0.2483	0.46304	D	R. Gautier
268	1879 IV	Aug. 24, 5	58	308	12	32	22	72	15	9.9962		R	Hartwig
269	1879 V	Oct. 4, 15	16	202	38	87	11	77	8	9.9955		D	A. Palisa
270	1880 I	Jan. 27. 10	48	278	23	356	17	36	52	7.7714	0.99947	R	W. Meyer
271	1880 II	July 1, 17	54	112	3	257	15	56	56	0.2587		R	J. Mayer
272	1880 III	Sept. 6, 22	36	82	12	45	19	38	6	9.5498		R	Molien
[244] T_3	1880 IV	Nov. 8, 0	4	43	5	296	51	5	23	0.0282	0.65530	D	Schulhof and Bossert
273	1880 V	Nov. 9, 10	7	261	4	249	23	60	42	9.8193		D	Bigourdan
[163] F	1881 I	Jan. 22, 16	7	50	50	209	36	11	20	0.2401	0.54902	D	Moeller
274	1881 II	May 20, 10	38	300	12	126	24	77	58	9.7717		D	Gruss
275	1881 III	June 16, 10	46	265	13	270	58	63	26	9.8660	0.99643	D	Bossert
276	1881 IV	Aug. 22, 7	30	334	55	97	3	39	46	9.8018		R	Stechert
277	1881 V	Sept. 13, 10	36	18	36	65	52	6	50	9.8609	0.83041	D	Plummer
278	1881 VI	Sept. 14, 8	55	267	52	274	10	67	11	9.6524		R	Millosevich
[96] E	1881 VII	Nov. 15, 1	43	158	30	334	34	12	53	9.5353	0.84550	D	Backlund
279	1881 VIII	Nov. 19, 13	30	63	31	181	18	35	10	0.2847		R	Bigourdan
280	1882 I	June 10, 12	52	53	56	204	56	73	49	8.7836	0.99999	D	Parsons
281	1882 II	Sept. 17, 5	32	276	25	346	1	38	0	7.8895	0.99991	R	Kreutz
282	1882 III	Nov. 12, 23	51	354	48	249	7	83	51	9.9802	0.99923	R	Wolyncewicz
283	1883 I	Feb. 18, 23	1	29	2	278	6	78	6	9.8809		D	Bryant
284	1883 II	Dec. 25, 7	25	125	46	264	25	65	1	9.4909		R	H.Oppenheim
[2124] P	1884 I	Jan. 25, 17	22	93	21	254	9	74	3	9.8897	0.95500	D	Schulhof and Bossert
85	1884 II	Aug. 16, 10	54	306	11	5	11	5	27	0.1070	0.58246	D	Berberich
286	1884 III	Nov. 17. 18	16	19	3	206	22	25	15	0.1964	0.55996	D	Krueger

was computed by KREUTZ, taking into account the perturbations of *Venus*, the *Earth*, *Jupiter* and *Saturn*, required no less than 1156 observations. These were brought together in thirty-one normal places. The period is 409.4±0.367 years.

222. A. N. 69: 106. Discovered 1861, December 28, by TUTTLE at Cambridge, U. S., and 1862, January 8, by WINNECKE in Pulkowa. On account of its rapid decrease in brightness it could be observed for but a short time; last observed February 2 by TIETJEN at Berlin. NOETHER has divided the few observations into sixteen normal places, and the elements agree remarkably well with those by V. FUSS (Bulletin de St. Petersb. 8) from four normals.

(96) E. Mem. de l'acad. de St. Petersb. 26 No. 2 (1878). ENCKE'S comet. Found October 4 by FOERSTER at Berlin; more generally observed in November, December and January. The observations at the Cape by MACLEAR extend from December 23, 1861 to March 12, 1862.

223. A. N. 58: 141. Discovered on July 2 by SCHMIDT at Athens, and an hour later by TEMPEL at Marseilles, and also on July 3 by BOND at Cambridge, and by SIMONS at Albany. The comet, owing to its nearness to the *Earth*, looked at first like a great nebula, even visible to the naked eye, but it soon decreased in brightness, and was observed only to July 30 (at Athens, Cambridge, U. S. and Clinton). The orbit above is from July 3, 10 and 23.

224. A. N. 59: 87. Probably first seen July 15, at Marathon, U. S., by SWIFT, who mistook it for the preceding comet [223]; more definitely located July 18 by TUTTLE at Cambridge; July 25 by P. ROSA at Rome; July 26 by SCHJELLERUP at Copenhagen. In August the comet was visible to the naked eye, moderately bright. It was observed at Athens by SCHMIDT up to September 26, and in the southern hemisphere by MANN at the Cape to October 27. From the observations formed into six normal places, v. OPPOLZER, taking account of the perturbations of the *Earth* and *Jupiter*, found the above orbit with a period equal to 121.502 years. Closely associated with this comet is SCHIAPARELLI'S discovery, in 1866, of the connection with the meteors of August 10.

225. A. N. 65: 61. Discovered November 27 by RESPIGHI of Bologna, and December 1 by BRUHNS at Leipzig. The observations before perihelion go only to December 17 (the last at Florence). After perihelion the comet was observed only twice, February 18 and 20, and with considerable difficulty, by BRUHNS. The above orbit is the most probable from all the observations divided into five normals.

226. A. N. 60: 149. Discovered by BRUHNS at Leipzig, November 30, one day before he found the preceding comet. At first, very faint; at the time of perihelion, brighter; observed by BRUHNS till March 12. Above orbit by ENGELMANN is a parabola computed from five normal places. The deviation from this curve is inappreciable.

227. Wien. Akad. S. B. 1864, A. N. 62: 343. Discovered April 11 by KLINKERFUES at Gottingen, and April 14 by DONATI at Florence. In May, visible to the naked eye; last observed November 15, at Pulkowa. FRISCHAUF has collected all the observations into eight normals, which are accurately represented by this orbit.

228. A. N. 60: 112. Discovered April 12 by RESPIGHI at Bologna, April 13 by BAEKER at Nauen, April 16 by WINNECKE at Pulkowa and TEMPEL at Marseilles, April 18 by KARLINSKI at Cracow. Last observed June 1, at Leyton, by ROMBERG. The orbit, by FRISCHAUF, is deduced from three normal places, April 18, May 7 and 18.

229. A. N. 61: 248. Discovered by TEMPEL at Marseilles, November 4, and eight days later by SCHMIDT at Athens; observed at Leipzig by BRUHNS till February 9, 1864. The elements are derived from three normal and two single places (to December 20) which are very well satisfied by the parabola.

230. Diss. inaug. Berol. 1869. Discovered December 28 by RESPIGHI at Bologna, and 1864, January 1, by BAEKER at Nauen; also January 9 by KARLINSKI at Cracow and by WATSON at Ann Arbor. Observed at Leyton by ROMBERG to March 1. In deriving the above elements the available observations were collected into nine normal places, and they agree very closely with the parabola computed by WEISS (A. N. 61: 349) from six normal places, January 3–23.

231. A. N. 68: 158. Discovered before either of the preceding comets, October 9 by BAEKER at Nauen and October 13 by TEMPEL at Marseilles, (Annuaire 1884). Last observed at Leipzig by ENGELMANN, April 13. The above orbit is the most probable parabola, from all the observations. A similar computation has been made by JULIUS, (A. N. 69: 6) and it gives a complete agreement with the above.

232. A. N. 73: 84. Discovered by DONATI at Florence, September 9; but few observations obtained. Last observed October 10 by ENGELMANN at Leipzig. The elements are from fourteen observations divided into three normal places.

233. A. N. 75: 164. Discovered July 4 by TEMPEL at Marseilles, July 5 by RESPIGHI at Bologna, July 11 by KARLINSKI at Cracow; last observed in the northern hemisphere at Athens September 22 by SCHMIDT. In the southern hemisphere the comet was first seen August 10 at Windsor, and August 11 at Santiago by MOESTA. It was observed at Windsor by TEBBUTT till September 25, and was seen as late as September 27; also seen September 26 at the Cape, but extremely faint. The elements are derived from seven normal places.

234. A. N. 66: 123. Discovered July 23 by DONATI and TOUSSAINT at Florence; observed in the northern hemisphere till the middle of August (at Leipzig by ENGELMANN to August 13) and then in the southern hemisphere, from November 2 to December 23 by MOESTA at Santiago. On its return to the northern hemisphere it was found again by SCHMIDT at Athens, January 19, 1865, and observed to January 30; last observed February 24 by PETERS at Clinton. The elements are deduced from six normal places, and take account of the perturbations of *Jupiter*.

235. A. N. 73: 90. Discovered by BAEKER at Nauen December 15; also by CHARCORNAC at Marseilles December 19, and by RESPIGHI at Bologna December 29 (Ann. 1884); last observed by STRASSER at Kremsmunster. Most probable orbit from seven normal places.

236. A. N. 68: 119. Discovered December 30 at Leipzig by BRUHNS; last observed January 29, 1865, by BRUHNS and EN-

GELMANN. The elements give the best possible agreement with the whole collection of observations.

237. M. N. 26: 84. Observed in the southern hemisphere only. Seen with the naked eye January 17, by ABBOTT at Hobart Town; January 18, by MOESTA at Santiago and by ELLERY at Melbourne; observed at the Cape from January 22 to May 2 by MANN. The above corrected elements by TEBBUTT Jr. represent very well the Melbourne and Windsor observations.

(96) E. Mem. de l'acad. de St. Petersb. 26 (1878). Seen February 13 at Leipzig by BRUHNS and ENGELMANN, and probably, also, before that date, by D'ARREST at Copenhagen (January 25). It could not be observed, however, till after perihelion, when it was seen, June 24, by TEBBUTT at Windsor and MANN at the Cape: last observed at the Cape July 22, though seen again July 23.

238. A. N. 68: 249. Discovered 1865, December 19, by TEMPEL at Marseilles, and 1866, January 5, by TUTTLE at Cambridge, U. S.; last observed February 9 by v. OPPOLZER at Vienna. According to OPPOLZER'S most probable orbit, deduced from all the observations, the period of revolution is 33.18 years. A computation made at the same time by PECHULE (A. N. 68: 270) leads to very nearly the same result. An agreement between the orbit of Comet 1866 I and the orbit of the meteors of November 13, as computed by SCHIAPARELLI and LE VERRIER was remarked by PETERS, and this comet in connection with Comet 1862 III furnished the data for SCHIAPARELLI'S discovery of 1866.

(163) F. Verhandl. d. Akad. in Stockholm 1872. FAYE'S comet. Found 1865 August 22 at Copenhagen by THIELE; last observed 1866 January 12 at the same place by D'ARREST.

239. A. N. 69:111. Discovered at Marseilles by STEPHAN, January 25, and at the same place by TEMPEL January 28; last observed by WINLOCK, at Cambridge, U. S., April 3. The ellipse satisfies the observations as far as they go.

240 T_1. A. N. 74: 103. Discovered April 3 at Marseilles by

TEMPEL; last observed August 21 by SCHMIDT at Athens, though seen till August 27. The elliptic form of the orbit was soon remarked, and it has been confirmed by the return of the comet in 1873 and 1879.

241. A. N. 73: 57. Discovered September 26 by BAEKER at Nauen and about four hours later by WINNECKE at Toennisstein near Brohl on the Rhine. Last observed October 31 at Helsingfors by KRUEGER. Elements from October 1, 14 and 27—in part normal places.

(171) Br. A. N. 93: 183. BRORSEN's comet. Found at Athens, April 11, by SCHMIDT, and about the same time by other astronomers also; last observed June 23 by SCHMIDT.

242. Manuscript; also Annuaire 1884: 214. Discovered June 13 by WINNECKE at Carlsruhe; last observed July 17 by SCHMIDT at Athens. The most probable parabola from the observations used, divided into seven normals; no ellipticity perceived.

(96) E. Mem. de St. Petersb. 26 (1878). Found July 17 by WINNECKE at Carlsruhe; last observed September 3 by VOGEL at Leipzig.

(131) W. A. N. 97: 338. WINNECKE's comet. Found by WINNECKE himself, April 9, at Carlsruhe; last observed October 12 by WEISS at Vienna. The first return of this periodic comet since its second discovery, 1858.

243. A. N. 81: 143. Discovered by TEMPEL at Marseilles. October 11; last observed November 12 by WEISS at Vienna. KOWALCZYK, SEYDLER (Wien Ak. S. B. 1871) and DOBERCK (A. N. 79: 384) have made accurate computations of the orbit from the few observations which were obtained. All three computations, although by different methods, give substantially the same result.

244 T_3. A. N. 99: 13. Discovered November 27 by TEMPEL at Marseilles; observed till December 31 by BRUHNS at Leipzig, and by STRASSER at Kremsmuenster. A deviation from a parabola was suggested at this first short appearance, but it was not fully established till 1880, when after two revolutions, it was discovered for the second time by SWIFT. The elements com-

puted by CHANDLER, Jr. (A. N. 99: 46) in 1880 agree closely with these by SCHULHOF and BOSSERT above.

245. Wien. Ak. S. B. 64 (1871). Discovered May 29 almost simultaneously by TEMPEL at Marseilles and by WINNECKE at Carlsruhe; last observed July 9, at Athens, by SCHMIDT. The orbit by SEYDLER computed from seven normal places agrees very closely with one by DREYER (A. N. 80: 221) from six normal places. DREYER suspects a connection with certain Perseid radiants (A. N. 82: 289).

246. A. N. 80: 237. Discovered by COGGIA at Marseilles, August 28; last observed at Hamburg by PECHULE, December 23. An orbit designated by the computer as provisional—from five normal places.

(189) d'A. Annales de l'Observ. de Paris 14 p. B. 25. D'ARREST's periodic comet. Found August 31 by WINNECKE at Carlsruhe; last observed December 20, by SCHMIDT at Athens.

247. A. N. 85: 323. Discovered November 23 by WINNECKE at Carlsruhe, and observed for only a week; last, by RUMKER at Hamburg November 30. The fourteen observations available were brought together by SCHULHOF into four normals.

248. A. N. 84: 330. Discovered April 7 by WINNECKE at Carlsruhe, April 13 by BORELLY at Marseilles, April 15 by SWIFT at Marathon (New York). Last observed May 16 by SCHMIDT at Athens, and once after perihelion, August 5, at the Cape. In the above system of elements, the third computed by HOLETSCHEK, the Cape observations, are included, and the result is an ellipse with a period of 5188 years, to whlch, however, considerable uncertainty is attached.

249. Diss. inaug. Leiden 1875. "Berekening van de loopbaan der Komet 1871 II." Discovered by TEMPEL at Milan June 14; last observed by RUMKER at Hamburg September 20. Most probable orbit, computed very carefully from all the observations.

(102) Tu. A. N. 77: 255. Found October 12 by BORRELLY at Marseilles, October 15 by WINNECKE at Carlsruhe, October

22 by Tuttle at Washington. Last observed, at Washington December 10, and also in the southern hemisphere, at the Cape, December 15, 1871 to January 30, 1872. First predicted return of comet 1790 II, re-discovered in 1858 by Tuttle and Bruhns.

250. A. N. 111: 112. Discovered November 3 by Tempel at Milan. The last European observation, November 18, was made at Hamburg by Rumker, but the comet was observed, January 19 to February 17, 1872, at the Cape, and January 17 to February 20, at Cordoba (Argentina). In the above orbit by Lindhagen these observations after perihelion are included, but it seems impossible to satisfy all the observations by a parabola.

(96) E. Mem. de St. Petersb. 26 No. 2: 121. Found September 19 by Winnecke at Carlsruhe, September 22 by Hind at Twickenham; picked up also by Stephan at Marseilles on September 18. Observed up to December 10 at Hamburg by Pechule, and at Lund by Wijkander.

For a nebula found by Tempel at Milan on December 29, and taken for a comet, see A. N. 78: 383, 80: 27 and A. V. S.7: 98.

A comet was discovered by Pogson at Madras on December 2, and was observed by him on December 2 and 3, but it was only two evenings not seen elsewhere. Accounts and investigations in regard to it are to be found in A. N. vols. 80, 81, 84; in M. N. vol. 33, and in A. V. S. vol. 10. The comet was found through a telegram from Klinkerfues, who had pointed out the probable visibility of Biela's comet in that particular part of the heavens, since the radiant of the great meteor shower of November 27 in the northern hemisphere had shown a close agreement with the comet's place. Discussions, both in favor of and against the connection of this comet with the meteor shower and Biela's comet have been published; those by v. Oppolzer (A. N. 81: 281) and by Bruhns (A. V. S. 10, 2) being of especial value.

(240) T.$_1$ A. N. 93: 319, 94: 157. Found with the help of Seeliger's ephemeris April 3, by Stephan at Marseilles; last observed August 1 by Andre and Baillaud at Paris. First return of Tempel's first comet. Its orbit has the least eccentricity (e=0.46) of all the comet orbits yet known.

251 T$_2$. Annuaire 1884 p. 229. Discovered by Tempel at Milan July 3; last observed by Hind and Plummer at Twickenham October 20. The second of the periodic comets discovered by Tempel: period, about 5 years (U=5.2 years), the shortest period next to that of Encke's comet.

(163) F. A. N. 80: 337. Found with Moeller's very accurate ephemeris, September 3 by Stephan at Marseilles, and observed there November 28 and 30; last observed December 23 by Peters at Clinton. On account of its faintness, not seen elsewhere.

252. A. N. 92: 72. Discovered August 20 by Borelly at Marseilles; last observed September 20 by Strasser at Kremsmuenster and by Hall at Washington. From five normal places, with the perturbations by *Venus*.

253. A. N. 83: 50. Discovered August 23 by Paul Henry at Paris; last observed by Palisa at Pola November 28 and December 17, the latter observation only approximate. The elements above include the post-perihelion observation of November 28.

(171) Br. A. N. 93: 183. Found August 31 by Stephan at Marseilles; last observed by Plummer at Twickenham, October 26.

254. A. N. 87: 122. Discovered November 10 by Coggia at Marseilles, and November 11 by Winnecke at Strassburg. Observed for only a few days:—by Weiss at Vienna till November 15. The computed orbits show a resemblance to the very roughly observed comets (No. 127 *b*,) 1818 I, and the above elements by Weiss assume a period of 6.2022 years.

255. A. N. 94: 200. Discovered by Winnecke at Strassburg February 20; observed February 20–25; last, at Pola by Palisa and at Vienna by Schulhof. The elements given above are deduced from all the observations made during this short time.

256. Wien. Ak. S. B. 77 (1878). Discovered April 11 by Winnecke at Strassburg, April 15 by Borelly at Marseilles and April 18 by Tempel at Milan. Last observed June 17 by Schulhof at Vienna. The above elements are from nine normal places, embracing all the observations.

257. Wien. Ak. S. B. 86, A. N. 103: 63. Discovered by Coggia at Marseilles April 17. At first faint, but it was approaching the *Earth*, and finally became one of the brightest of the more recent comets. In the northern hemisphere it was observed to July 17, (Schmidt at Athens saw the tail even to July 23) and then in the southern hemisphere from July 27 to October 18; last observed by Thome at Cordoba. The orbit by v. Hepperger is deduced from 618 observations divided into seventeen normals, and takes account of perturbations.

258. Wien. Ak. S. B. 1882, A. N. 104: 223. Discovered August 19 by Coggia at Marseilles; last observed November 14 by Plummer at Orwell Park. This orbit, computed from seven normal places, is an ellipse of 306.043 years' period. The observations are not satisfied by a parabola.

259. Wien. Ak. S. B. 1878 July. Discovered July 25 by Borelly at Marseilles; last observed at Hamburg by Rumker October 20. An ellipse computed from nine normal places represents the observations rather better than a parabola, though differing very little from the latter. Very nearly the same orbit was found from five normals by Gruber and Kurlaeder (A. N. 91: 79).

260. Wien. Ak. S. B. 1878 November, A. N. 94: 190. Discovered December 6 by Borelly at Marseilles; last observed January 7, 1875 by Bruhns at Leipzig. The above orbit embraces the few observations which could be obtained.

(131) W. A. N. 97: 338. Found February 1 by Borelly at Marseilles, and visible for a short time only, during the early morning hours. Last observed February 15 by Schiaparelli at Milan.

(96) E. Mem. de St. Petersb. 26 No. 2: 121. Found Janu-

ary 26 by Holden and Tuttle at Washington, and January 27 by Stephan at Marseilles; observed at Moscow by Bredichin to April 10, and after perihelion only three times, May 7 and 9 at Windsor by Tebbutt, and May 17 at Melbourne by White.

261. A. N. 100: 238. Discovered February 8 by Borelly at Marseilles, and February 9 by Pechule at Copenhagen, where it was also longest observed (to April 31.) These elements rest on five normal places.

262. A. N. 93: 45. Discovered by Winnecke at Strassburg April 5, and by Block at Odessa April 10. Last observed July 13 by Schmidt at Athens. The orbit is derived from about 280 observations,and takes account of perturbations.

263. Wien. Ak. S. B. 78: 976. Discovered April 11 by Swift at Rochester, April 14 by Borelly at Marseilles, April 16 by Block at Odessa. Block had, indeed, seen the comet on April 10, but he had not recognized the cometary character. The orbits computed by Nichol (A. N. 93: 42) and by Poenisch (A. N. 100: 63) both from normal places, show a very close agreement with Zelbr's orbit given above.

(189) d'A. Annales de l'observ. de Paris 14 p. B. 25. Found July 9 by Tempel at Arcetri, and by Coggia at Marseilles; also July 13 by Schmidt at Athens; last observed September 10 at Athens.

264. Wien. Ak. S. B. 1882 January, A. N. 101: 239. Discovered October 2 by Tempel at Florence. Observed only to October 14; last at Leipzig by Peter, at Milan by Schiaparelli, at Orwell Park by Plummer, and at Pola by J. Palisa. The elements above are derived from all the published observations, through four normals.

265. M. N. 38: 56, A. N. 91: 91. Discovered by Coggia at Marseilles September 13. The last observation is by J. Palisa at Pola, December 10. Above elements from observations to October 31.

266. A. N. 97: 277. Discovered July 7 by Swift at

Rochester, and observed on only four days, July 7, 10, 19 and 23, — by Peters at Clinton. The above is the most probable orbit from these four observations.

(96) E. A. N. 92: 193. Found August 3 by Tebbutt at Windsor; last observed September 6 at Cordoba by Thome.

(251) T_2. Annuaire 1884 p. 229. Tempel's second comet; found July 19 by Tempel at Arcetri, and last observed there December 18; seen also December 21.

(171) Br. A. N. 93; 185. Found January 14 by Tempel at Arcetri; first accurate observation February 26 by Tebbutt at Windsor; and last observed May 23 by Peter at Leipzig.

267. Diss. inaug. Vratisl. 1883, A. N. 108: 102. Discovered by Swift at Rochester June 16; last observed August 23, at Cambridge, U. S., by Wendell. The orbit depends on six normal places, embracing nearly all the observations.

(240) T_1. A. N. 94: 158. Second return of Tempel's first comet. Found by Tempel himself at Arcetri April 24, and also last observed by him July 8.

268. A. N. 96: 31. Discovered by Hartwig at Strassburg August 24; last observed on September 18 at Konigsberg by Franz. The above elements from August 28, September 8 and 13.

269. Wien. Ak. S. B. 81 (1880). Discovered by A. Palisa at Pola August 21; last observed at Rome October 22 by Tacchini. Above orbit from fifty-five observations arranged in five normal places.

270. A. N. 102: 88. The head of this comet was first seen by Gould at Cordoba, February 4, the tail having been noticed on January 31. In its general appearance, as well as in the elements of its orbit it was remarkably like Comet 1843 I. On account of the rapid decrease of its brightness it could not be observed, either in the southern hemisphere or here, later than February 19 (last at Cordoba by Gould). The investigations in regard to its orbit cannot be considered as en-

tirely definitive. The above orbit by W. Meyer, founded on seven normal places assumes hypothetically a period of 36.844 years going back directly to Comet 1843 I.

271. Wien. Ak. S. B. 1881 June, A. N. 100: 383. Discovered April 6 by Schaeberle at Ann Arbor. Last observed, before perihelion, on June 8, by Kortazzi at Nikolaiev, and after perihelion, September 8–11, by Bigourdan at Paris. The orbit by J. Mayer depends on eight normal places, and differs very little from one computed by Bigourdan from three normals April 8 to May 18 (C. R. 91: 74).

272. A. N. 105: 362, 106: 121. Discovered September 29 at Strassburg by Hartwig and September 30 at Ann Arbor by Harrington; last observed by Tempel at Arcetri November 30. From seven normal places, September 30 to November 30, which are well represented by the above orbit.

(244 T_3.) A. N. 99: 14, C. R. 91: 967. Discovered October 10 at Rochester by Swift, also November 27 at Dun Echt by J. G. Lohse. Observed to January 20 by Wendell at Cambridge, U. S. The identity with Comet 1869 III (Tempel) (which is now designated as the third periodic comet discovered by Tempel) was soon recognized, and with this assumption the above ellipse representing satisfactorily both returns was computed.

Cooper at Sheffield detected a comet December 21, 1880 and afterwards saw it December 21 and 25, but it was not seen elsewhere... Dr. Oppenheim has attempted to derive an orbit from the three positions, which are merely estimated to half a degree:

T=Nov. 8, 19h 32m. π=184° 2′. Ω=257° 36′. i=50° 48′. Log. q=9.5874. R. These however represent the middle place to only 19′. (A. N. 100: 73. The Observatory 4: 30, 217.)

273. C. R. 92: 172. Discovered at Copenhagen by Pechule December 16; observed at Paris by Bigourdan to March 31. Above elements are from observations of December 16th, January 1 and 19.

(163) F. Berl. Astr. Jahrb. 1882: [138]. First detected August 2, 1880 by Common at Ealing; afterwards found by Tempel at Arcetri, August 11, and first observed by the latter August 25. Observations continued at Washington by Hall to March 27, 1881.

274. A. N. 105: 315. Discovered by Swift at Rochester April 30, and only observed May 2–11; last (May 11) by Borelly at Marseilles. The above orbit is derived from four normal places, May 3–11.

A comet was seen by Barnard at Nashville, 1881 May 12 and 13, near *α Pegasi*, but it was not found May 14 and subsequently. *See* A. N. 100: 127, and Copernicus 1: 140.

275. C. R. 93: 660. A bright comet,—first seen in the southern hemisphere, May 22, by Tebbutt at Windsor, and a month later it appeared in the northern hemisphere, and was visible to the naked eye until the beginning of November. It was observed three months longer, (nearly nine months in all) and was last seen February 14, 1882 by Wendell at Cambridge, U. S. Soon after its discovery the resemblance of its orbit to that of the comet of 1807 was noticed, but further computation did not establish their identity. A great many computations of the orbit of this comet were made (more than thirty) but so far no one has taken in the whole series of observations. An orbit by Bossert was derived from eight normal places (with 423 observations, May 21 to September 29) and gives a period=2954.5 years. The orbit by Duner and Engstrom shows a remarkably close agreement (A. N. 100: 284.) The latter was formed from four normal places and represents the observations from May 27 to September 2 within a few seconds. Other elements differ from Bossert's only in the 6th decimal, the period, also, coming out 2954 years.

276. Diss. inaug. Kiel 1884. A. N. 108: 228, 437. Discovered July 14 by Schaeberle at Ann Arbor. visible to the naked eye at the same time as the preceding great comet, 1881 III. In Europe it was observed to September 13 by

TEMPEL at Arcetri; in the southern hemisphere by TEBBUTT at Windsor to October 15, at Melbourne by WHITE to October 8 (seen October 9 and 21;) at the Cape by GILL and ELKIN to October 18. The above is the most probable orbit from all the observations, and allows for perturbations.

277. Copernicus 3: 15, A. N. 105: 111. Discovered October 4 by DENNING at Bristol; last observed November 19 at Strassburg by WINNECKE. The orbit proved to be elliptic ($U=$ 8.86 years). In PLUMMER'S discussion, from eight normal places, perturbations are allowed for, and the star places are corrected from recent observations.

278. A. N. 102: 269. Discovered by BARNARD at Nashville, Tennessee, September 17; last observed at Cambridge, U. S., October 27 by WENDELL. The above orbit includes all the observations made in this short time.

(96) E. Bulletin de St. Petersb. 27, A. N. 100: 111. Found, by BACKLUND'S ephemeris, August 20, at Strassburg by WINNECKE and HARTWIG, and at Leipzig by PETER; also August 21 by TEMPEL at Arcetri and by SCHMIDT at Athens; more accurately observed August 24 by STRUVE at Pulkowa and August 25 by WINNECKE at Strassburg; last observed November 11 by TACCHINI at Rome.

279. C. R. 93: 1122. Discovered November 16 by SWIFT at Rochester; last observation January 12, 1882, by J. PALISA at Vienna. Elements from November 17, 27, December 12, 21.

280. A. N. 107: 94, M. N. 44: 12. Discovered March 17 by WELLS at Albany, U. S. Bright comet, and observed at the time of perihelion in full daylight. Last observed August 16 at the Cape of Good Hope by FINLAY. The above elements are derived from six normal places March 26 to August 7.

During the total solar eclipse of May 16, 1882, a comet was seen close to the *Sun* at Sohag in Egypt. Further information in regard to it will be found in A. N. 102: 271. The Observatory 5: 209, C. R. 94 and 95 [also Phil. Trans. Roy.

Soc. 175: 261]. Compare also Holetschek, Wien. Ak. S. B. 1883, November.

281. A. N. 104: 157. This great comet was discovered* with the naked eye, early in September at several places in the southern hemisphere: September 3 at Auckland, September 6 at Cordoba by Gould, September 7 at Melbourne by Ellery, September 8 at the Cape by Finlay, September 11 at Rio de Janeiro by Cruls. It developed into one of the grandest comets of this century, comparable only with the Comet of 1811, and Donati's Comet, 1858 VI.

On account of the unusual form of its orbit, and the great variety of new and strange physical phenomena, which could be observed with all our modern appliances, this comet must be regarded as standing alone in the history of astronomy. At the time of its perihelion, September 17 and 18, it was quite generally seen at many places in Europe and America,— even with the naked eye,— close to the *Sun*. Common at Ealing discovered it near the *Sun*, September 17, and the astronomers at the Cape observatory succeeded in observing it pass before the *Sun's* disk, where it completely disappeared. This would not be the place to go into further description. Observations of the comet's position were continued to June 1, 1883, when it was last observed by Thome at Cordoba. The above orbit depends on nine normal places, before and after perihelion, from September 8 to November 14. It shows, as was remarked very soon after the discovery, a striking resemblance to the orbits of the great comets, 1843 I and 1880 I, which is all the more surprising, since an identity of the two latter comets did not seem to accord entirely with the observations.

Besides a peculiar, broad, but faint* nebulous veil around the comet, Schmidt at Athens discovered on October 8th an irregular nebulous mass, apparently 4° southwest of the main comet, and separated entirely from it. This seemed to form a sort of companion comet, following approximately the motion of the larger comet (A. N. 103: 209, also HARTWIG, A. N. 106: 231). For attempts to determine the orbit of this nebulous object (the orbits do not differ very much from that of the main comet) *see Zelbr*, Wien. Ak. S. B. 86, and v. HEPPERGER, ib. 87.

---

* A letter, recently received from Dr. Galle, contains the following note in regard to this comet (1882 II): "The first actual observation of this great comet seems to have ben made by Finlay at the Cape, on September 7. It was seen with the naked eye at the Cape, as early as September 1, at Auckland September 3, and a few days later in South America and in Australia. The nebula near the comet was discovered by Schmidt at Athens, on October 9 (not October 8), and also, independently, on the same day, but a few hours later, by Hartwig in the southern hemisphere." [W. C. W.]

Similar nebulous masses were seen at a little distance from the comet, somewhat later by BARNARD at Nashville, BROOKS at Phelps and LA CAILLE at Olinda.

282. A. N. 104: 219. Discovered by BARNARD September 13 at Nashville, Tennessee; last observed December 8 by TEBBUTT at Windsor. Above orbit from five normals, September 19 to November 11.

283. M. N. 44: 88. Discovered February 23 by BROOKS at Phelps (N. Y.) and a little later on the same day, by SWIFT at Rochester (N. Y.); last observed April 15 by MILLOSEVICH at Rome. The above orbit is computed from March 3, 23 and April 12.

284. A. N. 108; 264. Discovered 1884 January 7th by Ross at Elsternwick near Melbourne; seen by ELLERY at Melbourne to February 19; last observation, however, not accurate Above orbit from five observations, January 12 to February 4.

On the 25 and 27 of December, 1883, a little before sunrise a bright comet was seen at New Norfolk, Tasmania, at an altitude of 8° or 10° above the horizon. Further particulars are found in A. N. 108: 275, 423 and The Observatory 7: 141.

(124) P. Bull. astr. 1: 26, A. N. 108; 10. For some time attention has been called by the very creditable work of SCHULHOF and BOSSERT to the return during this year, of the comet discovered by PONS in 1812 (for which an elliptic orbit had been computed by ENCKE) but quite unexpectedly on September 1, 1883, a comet was found by BROOKS of Phelps, N. Y., whose identity with the comet of 1812 was soon recognized. A great many observations were obtained in both hemispheres, and in

Australia and at the Cape it was followed to the end of April, and at Cordoba (Argentina) by W. G. Davis to May 26, 1884. A provisional correction to the orbit from five normal places (without, for the present, a change of the eccentricity) gave the above elements with a period of about 72 years.

285. A. N. 111: 15. Discovered by Barnard at Nashvill July 16; observed at Nice by Perrotin to November 20. The comet, soon after the first computations, proved to be elliptic with a period of 5.4 years. The above orbit includes observations from July 26 to October 23, and agrees very closely with one deduced by Morrison (M. N. 45: 50) from observations of July 25 to September 23.

286. A. N. 110: 207. Discovered by Max Wolf at Heidelberg, September 17; observed by Young at Princeton, N. J., to April 6. The above elements (derived from observations September 20–November 7) showed a small deviation from the observations. The orbit of this third comet of 1884 also proved to be elliptic, with a period of 6.8 years, and according to these elements a very near approach of the comet to the planet *Jupiter* must have taken place in May, 1875.

ADDENDA.

COMET 1883 I (BROOKS).—In a recent private letter from Assistant O. C. WENDELL, Harvard College Observatory, we have the following to be added to the foregoing catalogue:

BRYANT'S orbit (Table of Elements Comet 1833 I) is based on three observations, with an interval between the extreme ones, of forty days. His orbit is a parabola and satisfies the middle place as follows:

$$O - C$$

$$\Delta\lambda' \cos\beta' = +34.''1 \qquad \Delta\beta' = +74.''0$$

The orbits which Mr. WENDELL has computed are all based on forty-one observations, combined into three normal places, and including between the extreme normals an interval of forty-one days. He calculated first a parabola, satisfying the middle place within about 3′ of longitude and 1′ of latitude. To reduce these residuals still farther, he calculated a second parabola, but the values came out almost identically with the first. So that the parabola did not completely satisfy the data.

Then he computed a final elliptic orbit with the following results:

T = 1883, Feb. 18^d 22^h 45^m 56^s (Paris M. T.)
$\pi = 29^\circ\ 1'\ 58.''3$
$\Omega = 278\ \ 8\ \ 36.\ 3$
$i = 78\ \ 4\ \ \ 4.\ 9$
log. q = 9.8807707
log. e = 9.9996026
Motion direct.

Middle Place ($O - C$)

$\Delta\lambda' \cos\beta'$	$\Delta\beta'$
$+0.''05$	$+0.''03$

COMETS OF 1885.—The following list will bring the foregoing catalogue of comets down to 1886:

Comet 1885 I = Comet (d) 1884.
= ENCKE'S Comet.
Comet 1885 II = Comet (a) 1885.
= BARNARD'S Comet.
Comet 1885 III = Comet (c) 1885.
= BROOK'S Comet.
Comet 1885 IV = Comet (b) 1885.
= TUTTLE'S Comet.
Comet 1885 V = Comet (f) 1885.
= BROOKS' Comet.
Comet 1886 (Fabry) = Comet (d) 1885.
= Paris Comet.
Comet 1886 (Barnard) = Comet (e) 1885.

ERRATA.—Fifth line from top of page 1, for *Astronische* read *Astronomische.*

Tenth line from bottom of page 15, for Kurlaeder read Kurlaender.

Third line from bottom of Table of Elements, for 2124 read 124.

DATE DUE

GAYLORD

PRINTED IN U.S.A.

QB721.G3 ASTRO
3 5002 00173 0543
Galle, Johann Gottfried
Galle's catalogue of comets, translated

QB
721
G3 00173 0543

AUTHOR
Galle 34677

TITLE
Catalogue of comets

DATE DUE	BORROWER'S NAME
AUG 5 1975	Repairs

Astron

QB
721
G3 34677